

REMARKS

The claims of the present application have previously been made subject to a restriction requirement wherein the claims were deemed directed to three independent and distinct inventions. Applicants traversed this requirement, arguing that all the claims of the present application were directed to a single invention. However, applicants elected, for prosecution on the merits in this application, the claims of Group I, directed to claims 1-62 in the event that the restriction requirement was made final. The outstanding Official Action made that restriction requirement final. Thus, only claims 1-62 have been examined on the merits. Claims 63-72 have been withdrawn from consideration in this application.

Applicants have cancelled Claims 63-74 but reserve their right to file a divisional application directed to these claims during the pendency of the present application.

Applicants note the objections to a previously submitted Information Disclosure Statement (IDS), filed May 3, 2004. The Official Action indicates that the references cited in that IDS should be provided on Form PTO-1449. Applicants enclose completed Form PTO-1449 wherein these references are set forth. Applicants request that the references included on enclosed completed Form PTO-1449 be considered and be made of record in the file of the present application.

All the claims submitted for examination have been objected to and/or rejected on formal and substantive grounds. Applicants have amended their claims and

respectfully submit that all the claims currently in this application are patentable over the objection and rejections of record.

Turning first to the objection, Claims 2, 3, 13-18, 43-45, 48-51 and 54-60 stand objected to for the inclusion therein of the abbreviation "DS." This objection is predicated upon the absence of any definition of that abbreviation in the claims.

The Official Action suggests that the specific identity of the abbreviation be included in the first claim wherein that abbreviation is employed. Thus, in the instant Amendment, Claim 1 has been amended to incorporate the meaning of the objected to abbreviation. In so doing, applicants have defined the meaning of the abbreviation "DS" as meaning dry substance content. As such, applicants have overcome the objection in a manner suggested in the outstanding Official Action.

It is emphasized that the meaning of the abbreviation "DS" as meaning dry substance content measured by Karl Fischer titration, is fully supported by the originally filed specification at Page 11, lines 6-7.

All the claims examined on the merits in this application, Claims 1-62, stand rejected on formal grounds, under 35 U.S.C. § 112, second paragraph, as being indefinite.

Five specific grounds for this indefiniteness rejection are mentioned in the Official Action in support of the proposition that the claims examined in this application are vague and unclear. The first of these is the inclusion of the term "hydrolysis" in Claim 1.

This ground of rejection has been made moot by the amendment to Claim 1 wherein the recitation of the term “hydrolysis” has been qualified by the limitation that the hydrolysis is acidic or enzymatic. Clearly, the alleged vagueness of this term is removed by this recitation.

It is emphasized that this amendment to Claim 1 is fully supported by the originally filed specification at Page 14, lines 26-34.

The second basis for the alleged indefiniteness of the claims of the present application is the inclusion in Claim 1 of the term “fractionation.” The Official Action avers that it is unclear whether the fractionation step is intended to be chromatographic fractionation or fractionation by distillation or filtration.

Insofar as the specification makes it abundantly clear that the fractionation may be chromatographic or may be by filtration, it is apparent that limitation to a specific type of fractionation included in the claims would be unduly limiting. Suffice it to say, Claim 1 makes it apparent that any fractionation that results in the obtaining of a fraction enriched in arabinose, at least one other fraction enriched in rhamnose or mannose and, optionally, one or more fractions rich in saccharides other than monosaccharides suffices to meet the requirements of the present invention.

The third basis for the alleged indefiniteness of the claims is the inclusion of the term “and/or” therein. Applicants do not understand why this term is deemed indefinite. Whenever such a term is utilized it merely means that the term that follows may be in addition to or in place of the members mentioned therebefore.

The fourth ground of alleged vagueness and indefiniteness mentioned in the Official Action is the phrase “disaccharides as the nanofiltration retentate” that appears in Claim 33. The Official Action states that it is unclear whether the limitation(s) following that phrase are part of the invention.

The Official Action points to MPEP § 2173.05(d) in support of this ground of rejection. That section of the MPEP refers to exemplary claim language e.g. “for example,” “such as” and the like.

A cursory glance of Claim 33 indicates that there is no phrase subsequent to the quoted phrase. The claim clearly states that the nanofiltration retentate is a fraction enriched in poly-, oligo- and/or disaccharides. Applicants submit that the objected to phrase creates no indefiniteness.

The final ground in support of the indefiniteness rejection is predicated upon the vagueness and indefiniteness of the term “epimerization” in Claim 61. The Official Action argues that it is unclear whether the epimerization is accomplished by enzymatic or chemical reaction.

Applicants respectfully submit that, in the absence of any disclosure in the prior art about one or the other of these types of epimerizations with regard to the subject matter of Claim 61, support for accomplishment of epimerization by either of these two reactions permit applicants to claim the process of Claim 61 without qualification regarding which type of reaction effectuates epimerization.

All the claims examined on the merits in this application, Claims 1-62, stand rejected, on substantive grounds, under 35 U.S.C. § 103 (a) as being unpatentable over Ingle et al., Res. & Ind, 30, 369-373 (1985) in combination with US Patent 6,140,498 to Jumppanen et al. taken in view of US Patent 6,506,897 to Antila et al.

The Official Action argues that Claims 1-62 are drawn to a process of recovering arabinose and optionally at least one other monosaccharide selected from the group consisting of galactose, rhamnose and mannose from vegetable fiber which includes the following steps: (a) controlled hydrolysis of the vegetable fiber; (b) optional neutralization of the aqueous hydrolyzate of step (a) followed by at least one of the following steps: (c) fractionation of the aqueous hydrolyzate; and (d) crystallization of arabinose.

At the outset applicants note the amendment made to the broadest claim of the present application, Claim 1. Applicants have limited the hydrolysis step, which has been also limited to acidic or enzymatic hydrolysis, to one in which more than 50% of the heteropolymeric arabinose in the vegetable fiber is hydrolyzed into monomeric arabinose and that the aqueous hydrolyzate contains more than 10% arabinose on a dry substance content (DS), at least one other monosaccharide, which may be galactose, rhamnose or mannose, and, optionally, a poly-, oligo- and/or disaccharide. Furthermore, the optional step of neutralization of the aqueous hydrolyzate is recited to obtain neutralized hydrolyzate.

In addition, Claim 1 originally included either or both of (1) the step of fractionation of the aqueous hydrolyzate to obtain a fraction enriched in arabinose, at

least one other fraction enriched in galactose, rhamnose or mannose and optionally a fraction enriched in a saccharide other than a monosaccharide and (2) the step of crystallization of arabinose.

As amended, the fractionation step remains optional and is limited to an aqueous hydrolyzate obtained by separation of the solid hydrolyzate residue. In addition, the crystallization of arabinose, which was an optional step in the original process of Claim 1, is an essential limitation of all the claims of the amended application. Moreover, the step of crystallization of arabinose is furthermore spelled out as occurring in a aqueous solution from the hydrolyzate obtained in separation of the solid hydrolyzate residue and from the fraction enriched in arabinose, obtained in the fractionation of the aqueous hydrolyzate, resulting from that separation. Furthermore, the crystallization is required to occur by boiling and cooling, in which the product, crystalline arabinose, has an arabinose content of 98% on DS and a galactose content of less than 2% on DS.

It is emphasized that the process of the present application is independently defined in Claim 47 as a process of crystallizing arabinose from a biomass-derived solution wherein the crystallization includes boiling crystallization.

This brief summary is given to emphasize the non-obviousness of the process of the present application over the combined teachings of the applied references that constitute the substantive ground of rejection of record.

The principal Ingle et al. reference discloses the preparation of L-arabinose from gum ghatti by hydrolysis with dilute sulfuric acid at 90° C, the subsequent addition of an alcohol, a neutralization step followed by treatment with an alcohol. The

product crystalline L-arabinose has a melting point of 159°-160° C obtained by the crystallization from an alcohol.

The Ingle et al. process is fundamentally distinguished from the claims of the present application by the requirement that the crystallization step is carried out in an alcohol. The amended claims of the present application, as exemplified by Claim 1, requires that the crystallization be carried out from an aqueous solution. Moreover, the crystallization step of the present application, as set forth in independent Claim 1, requires that this step occur by boiling and cooling crystallization. Similarly, the only other independent claim, Claim 47, requires that the process of crystallizing arabinose from a biomass-derived solution comprise boiling crystallization.

The teaching of Ingle et al. provides no disclosure, teaching or suggestion that the crystallization of arabinose occur in an aqueous solution. Indeed, Ingle et al. not only requires that the crystallization of arabinose occur in an alcohol but that that alcohol be absolute. Those skilled in the art are aware that the term “absolute alcohol” defines ethanol substantially free of water. As such, it is clearly distinguished from an aqueous solution.

Those skilled in the art are aware that absolute alcohol is obtained in a process in which undesirable non-polar organics are utilized to rid the ethanol of water. As such, the arabinose product is less safe than arabinose obtained by crystallization of an aqueous solution which does not require the utilization of non-polar organics.

The secondary Jumppanen et al. reference discloses a method for preparing L-rabose by the epimerization of L-arabinose. This process is entirely

unrelated to the process of Claim 1, which is directed to a process of recovering arabinose without including any epimerization step.

The third applied reference, Antila et al., discloses a method of preparing crystalline L-arabinose by extraction of sugar beet pulp in a strong alkaline solution, hydrolysis with a strong acid, chromatographic separation with a cation exchanger in a monovalent metal form, purification with cation and anion exchanges and absorbent resins and recovery of L-arabinose as a crystalline product having an arabinose purity of over 98%.

The above recitation emphasizes the more complex process employed in Antila et al. to produce L-arabinose in the same purity as that obtained by the simpler process defined in Claim 1 of the present application.

As far as the critical crystallization step is concerned, Antila et al. employs concentrating a purified solution by evaporation to 70% by weight, seeding with arabinose seed crystals and crystallization by cooling to room temperature. Thus, the step employed in Antila et al. occurs during the cooling stage, subsequent to the seeding step. The Antila et al. evaporation step, which occurs before seeding, is utilized to achieve the necessary arabinose concentration in the solution to permit crystallization to occur.

The above remarks emphasize that Antila et al. is distinguished from the claims of the present application because that teaching utilizes cooling crystallization. The distinguished boiling and cooling crystallization process of the present application, as set forth in step (e) of Claim 1 and in independent Claim 47, wherein it is recited that the crystallization process includes boiling crystallization, is explained in detail at Page

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23, lines 28 to Page 24 of line 12 of the instant specification. Therein it is stated that the arabinose solution is first evaporated to slight supersaturation at the boiling point of the solution. The solution is seeded and the evaporation is continued at the boiling point of the crystallization mass. As such, it is clear that boiling crystallization occurs. As stated in the specification, this procedure provides improved crystal sized distribution and yield. It is emphasized that Example 15B, at Page 48 of the specification, exemplifies this procedure.

The crystallization of the present application differs from the crystallization practiced by Antila et al. In the present invention boiling crystallization step of the process of the present application, the boiling crystallization step occurs immediately subsequent to the seeding step. In Antila et al., which also practices crystallization subsequent to the seeding step, the step subsequent to seeding is a cooling step. Thus, whereas the process of the present invention involves crystallization carried out by boiling, the process of Antila et al. practices crystallization by cooling. Stated differently, the process of Antila et al. includes no boiling step after the seeding step. As a result, Antila et al. does not disclose boiling crystallization.

What is clear from the above remarks, as set forth in the specification, is that the process of the present application, which comprises boiling crystallization followed by a cooling step, emphasizes that the main crystal yield is achieved during the boiling step. This crystallization step is fundamentally distinguished from the process taught by Antila et al. and thus from the combined teaching of the applied references.

The above remarks make it abundantly clear that the sole substantive ground of rejection imposed in the outstanding Official Action, the obviousness rejection

predicated upon the combined teaching of the three above-discussed applied references, does not make obvious either of the independent claims, Claims 1 and 47, currently in this application. The additional limitations of the dependent claims further distinguish the claims of the present application from his ground of rejection. Reconsideration and removal of this ground of rejection is therefore deemed appropriate. Such action is respectfully urged.

It is emphasized that many of the claims have been amended to correct improper Markush group language. None of these changes involve the introduction of new matter. Rather, they correct obvious typographical errors.

The above amendments and remarks establish the patentable nature of all the claims currently in this application. Notice of Allowance and passage to issue of these claims, Claims 1-9, 11, 12, 14-38, 40 and 44-62, is respectfully solicited.

Respectfully submitted,



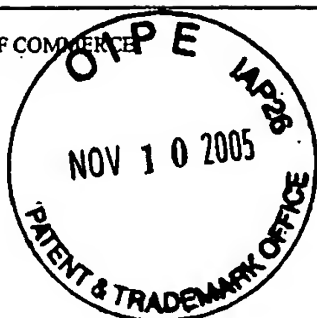
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LIST OF PRIOR ART CITED BY APPLICANT

(Use several sheets if necessary)



Atty. Docket No.
17195

Serial No.
10/697,763

Applicant
Heikki Heikkila, et al.

Filing Date
October 30, 2003

Group
1623

U.S. PATENT DOCUMENTS

EXAMINE R INITIAL*		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE (if appropriate)
	AA	4,516,566	05/14/85	Chao, et al.			
	AB	4,772,334	09/20/88	Hatanaka, et al.			
	AC	4,816,078	03/28/89	Schiweck, et al.			
	AD	4,880,919	11/14/89	Kulprathipanja			
	AE	6,262,318	07/17/01	Heikkila, et al.			
	AF	6,506,897 B1	01/14/03	Antila, et al.			
	AG	6,548,662	04/15/03	Ohsaki, et al.			

		Foreign Document Number	Date	Country	CLASS	SUBCLASS	TRANSLATION	
							YES	NO
		EP 0 560 284 B1	09/15/93	EPO			X	
		EP 1 340 504	09/03/03	EPO			X	
		EP 1 076 100	02/14/01	EPO			X	
		JP 2002153245	05/28/02	Japan				X
		JP 2002136278	05/14/02	Japan				X
		CN1373135A	10/09/02	China			X	
		SU 1009470A	04/07/83	Russia				X
		DD 143 261	08/13/80	Germany				X

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	Agarwal, A. et al., Indian Journal of Chemistry, Section B, Organic Chemistry Including Medicinal Chemistry, 1988
	Osman, M.E. et al., Phytochemistry (Oxford), vol. 38, No. 2 (1995), pp. 409-417
	Aspinall, G.O. et al., Journal of the Chemical Society, Abstracts (1958) 4408-14

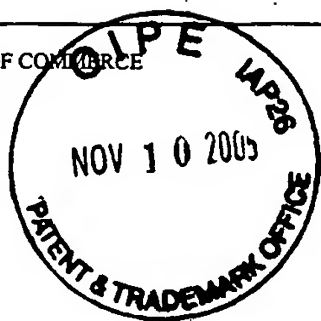
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	AA						

		Foreign Document Number	Date	Country	CLASS	SUBCLASS	TRANSLATION	
							YES	NO
		CS 181 485	01/15/80	Czech				X
		CS 153 378	05/15/74	Czech				X
		CS 137 537	07/15/70	Czech				X
		CS 139 427	12/15/70	Czech				X
		WO 01/21271 A1	03/29/01	PCT				X
		WO 02/27039 A1	04/04/02	PCT			X	
		20012605		Finland				X

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	Aspinall, G.O. et al., Journal of the Chemical Society, Abstracts (1963) 1714-21
	Ingle, T.R. et al., Research and Industry, 30(4) (1985) pp. 369-373
	Nyun, Ho Park et al., Biotechnology Letters, 23(5) (March 2001) pp. 411-416
	Kroplien, U., Carbohydrate Research, 32 (1974) pp. 167-170
	Takasaki, Y., Agr. Biol. Chem., Vol. 36, No. 13 (1972) pp. 2575-2577
	Drzhevetskaya, A., Byul. Eksperim. Biol. Med., 61 (1966), p. 40
	Chem Abstr. 65 (1966) 9482d

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